IN THE CLAIMS:

Kindly amend the claims, without prejudice, without admission, without surrender of subject matter, and without any intention of creating any estoppel as to equivalents as follows:

1. (Currently Amended) An ion beam scanning system having an ion source device, an ion accelerator system that can be set to an acceleration of ~~the~~ ions required to obtain a maximum depth of penetration, and an ion beam guidance system (1) comprising an ion beam outlet window (2) for a converging centred ion beam (3), and a mechanical alignment system (4) for ~~the~~ a target volume (5) to be scanned,

~~characterized in that~~ wherein the scanning system (6) comprises energy absorption means (7) that are arranged in the path of the ion beam between the target volume (5) and the ion beam outlet window (2) transverse to the centre of the ion beam and comprises absorber wedges (13) that can be displaced transverse to the centre of the ion beam, a high-performance linear motor (8) for rapid driving of the absorber wedges (13) and beam-intensity-controlled depth-scanning with transverse displacement of the energy absorption means (7), so that depth-staggered scanning of volume elements (9) of a tumour tissue (11) can be carried out in rapid succession, and an ionisation chamber (16) for measuring beam intensity, which is arranged upstream of the energy absorption means (7).

2. (Currently Amended) The ~~I~~ion beam scanning system according to claim 1, ~~characterized in that~~ wherein the target volume (5) is ~~a~~ the tumour tissue (11) surrounded by healthy tissue (10), and wherein the depth of penetration (12) of the ion beam (3) is determined by ~~the~~ energy of the ions in the ion beam (3) and ~~the~~ a deepest region of the tumour tissue (11) can be reached by means of ~~the~~ variable acceleration of the ions.

3. (Currently Amended) The ~~I~~ion beam scanning system according to claim 1, ~~characterized in that~~ wherein the scanning system further comprises an electronic control system (14, 34) for the linear drive of the absorber wedges (13) and includes an ionisation chamber (16) for measuring the particle rate of the beam and moves the absorber wedges (13) closer together by a step, ~~preferably of from 10 μm to 100 μm~~, when a predetermined particle count has been reached, which particle count may be different for each depth step, so enabling depth-staggered scanning of volume elements (9) of the target volume (5).

4. (Currently Amended) The ~~I~~ion beam scanning system according to claim 1, ~~characterized in that~~ wherein the energy absorption means (7) comprise at least two absorber wedges (13) that can be displaced in opposite directions transverse to the centre of the ion beam.

5. (Currently Amended) The ~~I~~ion beam scanning system according to claim 1, ~~characterized in that~~ wherein the energy absorption means (7) comprise two absorber wedge assemblies (18) that can be displaced in opposite directions transverse to the centre (17) of the ion beam.

6. (Currently Amended) The ~~I~~ion beam scanning system according to claim 1, ~~characterized in that~~ wherein the scanning system further comprises an edge-delimitation device (20) having displaceable shutter elements (21) between the target volume (5) and the energy absorption means (7).

7. (Currently Amended) The ~~I~~ion beam scanning according to claim 1, ~~characterized in that~~ wherein the scanning system further comprises edge shutters (19) that can be adjusted separately in the manner of an iris diaphragm in order to delimit some of ~~the~~ an edge of the ion beam (3) with respect to the target volume.

8. (Currently Amended) The ~~I~~ion beam scanning system according to claim 1, ~~characterized in that it comprises~~ further comprising a patient table (22) that carries the target volume (5) and that can be displaced in a plane transverse to the ion beam (3) in two directions of co-ordinates during an irradiation procedure.

9. (Currently Amended) The ~~I~~ion beam scanning system according to claim 1, ~~characterized in that it comprises~~ further comprising a patient table (22) that carries the target volume (5) and that can be displaced in a lateral direction transverse to the ion beam (3) during an irradiation procedure and has deflection magnets (23, 24, 25) that deflect the ion beam (~~1~~3) from its central position at the outlet window (2) transverse to the lateral direction of the patient table (22).

10. (Currently Amended) The ~~I~~ion beam scanning system according to claim 1, ~~characterized in that~~ wherein the intensity of the ion bean scanning is defined by ~~the~~ a total number of ions that strike ~~a~~ the volume element (9).

11. (Cancelled).

12. (Currently Amended) The ~~I~~ion beam scanning system according to claim 1, ~~characterized in that it comprises~~ further comprising a patient table (22) that carries the target volume (5) and that can be displaced in a lateral direction transverse to the ion beam (3) during irradiation, and ~~has~~ a ~~gentry~~ gantry system (27) that can be rotated about a gantry area axis of rotation transverse to the lateral direction of movement of the patient table (22).

13. (Currently Amended) The ~~I~~ion beam scanning system having ~~a~~ the gantry system (27) for aligning ~~an~~ the ion beam (3) with ~~a~~ the target volume (5) according to claim 12, ~~characterized in that~~ wherein the ion beam (3) is supplied to the gantry system (27) in the gantry axis of rotation (28) and can be aligned with a target volume (5) by means of magneto-optics (23, 24, 25) at adjustable angles of from 0 to 360° in a plane orthogonal to the gantry axis of rotation (28) so that the ion bean (3) intersects the gantry axis of rotation (28) at an isocentre (29) of the gantry system (27), wherein the gantry system (27) comprises a target volume carrier (30) that can be displaced laterally in the direction of the gantry axis of rotation (28), the target volume (5) is arranged upstream of the isocentre (29) and energy absorption means (7), which are arranged radially upstream of the gantry system (27), define volume element scanning in ~~the~~ a depth direction, the gantry system (27) defines angular volume element scanning in ~~the~~ a lateral direction and the laterally displaceable target volume carrier (30) defines volume element scanning in ~~the~~ a longitudinal direction, and target volumes (5) of any shape can be scanned by volume element by a combination of ~~those three scanning means~~ the energy absorption means (7), the gantry system (27) and the target volume carrier (30).

14. (Currently Amended) The ~~I~~ion beam scanning system having ~~a~~ the gantry system according to claim 13 ~~characterized in that~~ wherein the target volume carrier (30) remains stationary during irradiation and the deflection magnets (23, 24, 25) deflect the ion beam (3) in the gantry plane during irradiation.

15. (Currently Amended) The ~~I~~ion beam scanning system having ~~a~~ the gantry system according to 13, ~~characterized in that~~ wherein the energy absorption means (7) comprise absorber wedges (13) that can be displaced tangential to ~~the~~ a circle of rotation of the gantry system (27).

16. (Currently Amended) The ~~I~~ion beam scanning system having ~~a~~ the gantry system according to claim 13, ~~characterized in that~~ wherein the energy absorption means (7) comprise at

least two absorber wedges (13) that can be displaced in opposite directions tangential to ~~the~~ a circle of rotation of the gantry system (27).

17. (Currently Amended) The ~~I~~ion beam scanning system having ~~a~~ the gantry system according to claim 13, ~~characterized in that~~ wherein the energy absorption means (7) comprise absorber wedge assembles (18) that can be displaced in a radially staggered manner tangential to ~~the~~ a circle of rotation of the gantry system (27).

18. (Currently Amended) An ion beam scanning system having an ion source device, an ion accelerator system that can be set to an acceleration of ions required to obtain a maximum depth of penetration, and an ion beam guidance system (1) comprising an ion beam outlet window (2) for a converging centred ion beam (3), and a mechanical alignment system (4) for a target volume (5) to be scanned, wherein the scanning system (6) comprises energy absorption means (7) that are arranged in the path of the ion beam between the target volume (5) and the ion beam outlet window (2) transverse to the centre of the ion beam and comprises absorber wedges (13) that can be displaced transverse to the centre of the ion beam, a high-performance linear motor (8) for rapid driving of the absorber wedges (13) and beam-intensity-controlled depth-scanning with transverse displacement of the energy absorption means (7), so that depth-staggered scanning of volume elements (9) of a tumour tissue (11) can be carried out in rapid succession,

and a patient table (22) that carries the target volume (5) and that can be displaced in a lateral direction transverse to the ion beam (3) during irradiation, and a gantry system (27) that can be rotated about a gantry area axis of rotation transverse to the lateral direction of movement of the patient table (22) and

wherein the ion beam (3) is supplied to the gantry system (27) in the gantry axis of rotation (28) and can be aligned with a target volume (5) by means of magneto-optics (23, 24, 25) at adjustable angles of from 0 to 360° in a plane orthogonal to the gantry axis of rotation (28) so that the ion bean (3) intersects the gantry axis of rotation (28) at an isocentre (29) of the gantry system (27), wherein the gantry system (27) comprises a target volume carrier (30) that can be displaced laterally in the direction of the gantry axis of rotation (28), the target volume (5) is arranged upstream of the isocentre (29) and energy absorption means (7), which are arranged radially upstream of the gantry system (27), define volume element scanning in a depth direction,

the gantry system (27) defines angular volume element scanning in a lateral direction and the laterally displaceable target volume carrier (30) defines volume element scanning in a longitudinal direction, and target volumes (5) of any shape can be scanned by volume element by a combination of the energy absorption means (7), the gantry system (27) and the target volume carrier (30) and wherein ~~Ion beam scanning system having a gantry system according to claim 13, characterized in that~~ a central region of the target volume (5) is arranged upstream of the isocentre (29) by at least one fifth of ~~the~~ a radius of the gantry system, so that the target volume (~~9~~5) ~~itself~~ does not lie in the isocentre (29).

19. (Currently Amended) A ~~M~~method of ion beam scanning using an ion source device, an ion accelerator system and an ion beam guidance system (1) comprising an ion beam outlet window (2) for a converging centred ion beam (3), and a mechanical alignment system (4) for scanning a ~~the~~ target volume (5) ~~to be scanned~~, the scanning system (6) comprising energy absorption means (7) and an ionisation chamber (16), which is arranged upstream of the energy absorption means (7), ~~characterized by the following method steps~~ comprising the steps of:

- setting ~~of~~ the ion accelerator system to an acceleration of the ions required to obtain a maximum depth of penetration (12),
- ~~detection~~ detecting ~~of~~ ion beam intensity,
- ~~traverse~~ traversing displacement of the energy absorption means (7) of variable thickness for depth modulation of the ion bean (3),
- ~~summation~~ summing ~~of the~~ radiation ions of a volume element (9) of ~~a~~ the target volume (5) up to a predetermined radiation dose,
- ~~alteration~~ altering ~~of~~ the depth of penetration of the ion beam (3) by means of transverse displacement of the energy absorption means (7) when the predetermined radiation dose of the volume element (9) has been reached in order to irradiate ~~the~~ a next upstream volume element.

20. (Currently Amended) The ~~M~~method according to claim 19, ~~characterized in that~~ wherein an electronic control system (14) for ~~the~~ a linear drive of the absorber wedges (13) measures ~~the~~ a particle rate of the beam by means of ~~an~~ the ionisation chamber (16) and moves the absorber wedges (13) closer together by a step~~, preferably from 10 to 100 μm~~, after a predetermined particle rate bas been reached, which particle rate may be different for each depth

step, so that ~~the~~ a depth-staggered scanning of volume elements (9) of the target volume (5) is effected.

21. (Currently Amended) A method of ion beam scanning using an ion source device, an ion accelerator system and an ion beam guidance system (1) comprising an ion beam outlet window (2) for a converging centred ion beam (3), and a mechanical alignment system (4) for scanning a target volume (5), the scanning system (6) comprising energy absorption means (7) and an ionisation chamber (16), which is arranged upstream of the energy absorption means (7), comprising the steps of:

- setting the ion accelerator system to an acceleration of the ions required to obtain a maximum depth of penetration (12),
- detecting ion beam intensity,
- traversing displacement of the energy absorption means (7) of variable thickness for depth modulation of the ion bean (3),
- summing radiation ions of a volume element (9) of the target volume (5) up to a predetermined radiation dose,
- altering the depth of penetration of the ion beam (3) by means of transverse displacement of the energy absorption means (7) when the predetermined radiation dose of the volume element (9) has been reached in order to irradiate the next upstream volume element

~~Method according to claim 19,~~ ~~characterized in that~~ wherein the intensity is adjusted to from 10^6 to 10^8 absorbed ions per volume unit during scanning of the target volume (5).

22. (Currently Amended) The ~~M~~method according to claim 19, ~~characterized in that~~ wherein the scanning of the volume of the target volume (5) progresses continuously.

23. (Currently Amended) The ~~M~~method according to claim 19, ~~characterized in that~~ wherein the scanning of the volume of the target volume (5) in ~~the~~ a depth direction is effected by columns.

24. (Currently Amended) The ~~M~~method according to claim 19, ~~characterized in that~~ wherein the scanning of the volume of the target volume (5) proceeds stepwise.

25. (Currently Amended) The ~~M~~method according to claim 19, ~~characterized in that~~ wherein the scanning of the target volume (5) is carried out continuously in ~~the~~ a depth direction and stepwise in ~~the~~ a lateral and longitudinal directions.

26. (Currently Amended) The ~~M~~method according to claim 19, ~~characterized in that~~ wherein the scanning of the volume of the target volume (5) is carried out continuously in ~~the~~ a depth direction and in ~~the~~ a lateral direction and stepwise in ~~the~~ a longitudinal direction.

27. (Currently Amended) The ~~M~~method of operating an ion beam scanning system according to claim 19 using a gantry system (27) for aligning ~~an~~ the ion beam (3) with ~~a~~ the target volume (5), wherein the ion beam (3) is supplied to the gantry system (27) in ~~the~~ an axis of rotation and is aligned with ~~a~~ the target volume (5) by means of magneto-optics (23, 24, 25) at adjustable angles of from 0 to 360° in a plane orthogonal to the gantry axis of rotation (28), so that the ion beam (3) intersects the gantry axis of rotation (28) at an isocentre (29) of the gantry system (27), wherein the gantry system (27) comprises a target volume carrier (30) that can be displaced laterally in the direction of the gantry axis of rotation (2~~9~~8), ~~characterized by the following method~~ comprising the steps of: ~~arrangement~~ arranging ~~of~~ the target volume (5) upstream of ~~the~~ an isocentre (29), scanning ~~of~~ the volume element in ~~the~~ a depth direction by means of energy absorption means (7) arranged radially upstream of the gantry system (27), scanning ~~of~~ the volume element in ~~the~~ a lateral direction by altering the angle of rotation of the gantry system (27), and scanning of the volume element in ~~the~~ a longitudinal direction by lateral displacement of the target volume carrier (30).

28. (Currently Amended) The ~~M~~method of operating an ion beam scanning system according to claim 19 using a gantry system (27), ~~in which~~ wherein a target volume carrier (30) is aligned before irradiation and remains stationary during irradiation and the ion beam (3) is deflected in the gantry plane by means of the last gantry deflecting magnets (23, 24, 25) in order to carry out volume element scanning in ~~the~~ a longitudinal direction.

29. (New) The ion beam scanning system according to claim 3, wherein the step is from 10 μm to 100 μm.

30. (New) The method according to claim 20, wherein the step is from 10 μm to 100 μm.

31. (New) An ion beam scanning system having an ion source device, an ion accelerator system that can be set to an acceleration of ions required to obtain a maximum depth of penetration, and an ion beam guidance system (1) comprising an ion beam outlet window (2) for a converging centred ion beam (3), and a mechanical alignment system (4) for a target volume (5) to be scanned, wherein the scanning system (6) comprises energy absorption means (7) that are arranged in the path of the ion beam between the target volume (5) and the ion beam outlet window (2) transverse to the centre of the ion beam and comprises absorber wedges (13) that can be displaced transverse to the centre of the ion beam, a high-performance linear motor (8) for rapid driving of the absorber wedges (13) and beam-intensity-controlled depth-scanning with transverse displacement of the energy absorption means (7), so that depth-staggered scanning of volume elements (9) of a tumour tissue (11) can be carried out in rapid succession and wherein the linear motor comprises rotors (31) mounted on air bearings.